

THE CONCEPT OF CONTROL

BY

SAVILLA ALICE ELKUS, PH.D.

ARCHIVES OF PHILOSOPHY

EDITED BY

FREDERICK J. E. WOODBRIDGE

NO. 1, SEPTEMBER, 1907

DISSERTATION

Submitted in Partial Fulfillment of the Requirements for the Degree
of Doctor of Philosophy under the Faculty of Philosophy,
Columbia University

NEW YORK

THE SCIENCE PRESS

1907



Digitized by the Internet Archive
in 2026

https://archive.org/details/IA41555013_0037

THE CONCEPT OF CONTROL

BY

SAVILLA ALICE ELKUS, PH.D.

ARCHIVES OF PHILOSOPHY

EDITED BY

FREDERICK J. E. WOODBRIDGE

No. 1, SEPTEMBER, 1907



DISSERTATION

Submitted in Partial Fulfillment of the Requirements for the Degree
of Doctor of Philosophy under the Faculty of Philosophy,
Columbia University

NEW YORK

THE SCIENCE PRESS

1907

PRESS OF
THE NEW ERA PRINTING COMPANY
LANCASTER, PA.

INTRODUCTION

IN the various attempts to render an adequate description of the world of experience as presented in the history of thought, we find recurring such conceptions as purpose, teleology, final cause, design, to denote certain features which have been deemed indispensable to an exhaustive interpretation of reality. Upon reflection it appears that these categories and their like constitute so many variants of the wider concept of control; and as such express specific ways in which control has been apprehended. That is, these different predicates are diverse methods of explaining control, of making explicit elements thought to be involved in its postulation.

In the present essay, I propose to examine various typical conceptions of control as expressed or implied in the respective theories of philosophy, with the view to determine in what facts or ultimate assumptions these conceptions have their basis. To the same end the investigation will consider the concept of control as involved in the fundamental principles of the science of biology and in the formulations of mechanical explanation.

The historical treatment of the subject falls naturally into two main divisions, distinguished, in one way at least, by their methods of approaching philosophical problems. These divisions are occupied with the metaphysical and epistemological discussions, respectively, the latter including the theory of pragmatism.

Since the science of biology, in its explanation of organic nature, has employed certain categories generally regarded as peculiar to its subject-matter, the third section will consider the notion of control as involved in the characteristic principles of biology. Finally, mechanism, which formulates the principles obtaining in inorganic nature, or the physical world, will be treated in the fourth section.

A comparison of the results obtained from these various sources will serve to manifest those characteristics common to all the conceptions, and at the same time indicate the ground of any peculiar features deemed essential to the category. Such an analysis of the data presented will seek to determine those elements of the conception which may be retained as justifiable, and those which must be rejected as unwarranted by experience; those factors which are purely gratuitous, and those which are the outcome of a logical demand.

CONTENTS

	PAGE
INTRODUCTION	iii
CHAPTER I	
COSMOLOGICAL	
The concept of control as a thesis of the philosophical movement expressed in the theories of Heraclitus, Empedocles, Anaxagoras and Democritus—The thesis in the fragments of Heraclitus—Empedocles, Anaxagoras and Democritus—The concept indicated in the 'Dialogues' of Plato—The concept in the philosophy of Aristotle—Stoicism—Scholastic philosophy not occupied with the question of control—The concept in the philosophy of Spinoza—The concept in the philosophy of Leibniz—Comparison of the concepts in the cosmological theories	1
CHAPTER II	
EPISTEMOLOGICAL	
The epistemologies of Locke, Berkeley, Hume and Kant concerned with the <i>locus</i> of control; these writers give speculative accounts of the teleological aspect of nature—Locke's position with respect to control in epistemology; his theory of design in nature—Berkeley's theory of control and design—Hume's position with respect to control—Kant's theory of control; his conception of purpose in nature—The concept of control in pragmatism	19
CHAPTER III	
BIOLOGICAL	
The concept as revealed in the peculiar categories of biology	29
CHAPTER IV	
MECHANISM	
The concept in the method and constructions of physical science	34
CHAPTER V	
CONCLUSIONS AND REMARKS	
Comparison of all the conceptions which have been discussed—Purpose and mechanism two diverse ways of describing control—Application of the concept in the sciences of mechanics, economics, sociology	39

THE CONCEPT OF CONTROL

CHAPTER I

COSMOLOGICAL

THE philosophical movement embodied in the theories of Heraclitus, Empedocles, Anaxagoras and Democritus may be interpreted as one of which an important function is the expression of the recognition of the concept of control in description and explanation of the world, and the discovery of such conditions as permit its affirmation. This movement accepts as a primary datum of experience general flux or change, and superimposes the further reflection that the change is regulated, that it is not merely change; its method may be comprehended. For the detailed exposition of this interpretation we must have recourse to the respective theories of the philosophers.

Heraclitus, purporting to render an analysis of the world of experience, maintains as his grand discovery that in addition to the flux of sensible things there exists a principle of a different nature. Fragments¹ 25, 26, 41 and 42, 43, 44, 62, proclaim the existence of universal change; while in contradistinction fragment 1 announces: “... , ἐν παντα εἶναι” (all things are one); there is connection of these diverse sensible things. For the elucidation of this phrase we must turn to what Heraclitus deems his unique contribution.

Fragment 18 states: “Of all whose words I have heard, none has attained to this, to know that wisdom (σοφόν) is from all things separate.” As to the nature of this wisdom, different from all things, fragment 19 asserts: “Wisdom is one, to know the thought (γνώμην) by which all things are steered through all things.”

That is, this γνώμη (thought, intelligence) is a principle ‘steering,’ directing the sensible flux, existing *in* the dynamic world and perceptible to intelligence or wisdom (σοφία). As to the specific characteristics which have afforded the ground for the observation of the existence of this γνώμη in all things, we learn that there is order preserved in the events, there is regulation of the happenings; the manifold is a cosmos. (Indicated in Fr. 20): “This order (κόσμον) which is the same in all things, no one of gods or men has made; but it was ever, is now, and ever shall be, an ever-living fire, fixed measures of it kindling and fixed measures going out.” (Also indicated in Fr. 28, 29, 61.)

¹ Bywater, ‘Heracliti Ephesii Reliquiae.’

All diversity constitutes one process (Fr. 24, 35, 36, 39, 40, 57) by means of a principle of connection called harmony (*ἁρμονίη*), whose essence is the holding of differences together, the combining of two opposites into one. (Indicated in Fr. 45, 46, 56, 59.)

The general thesis of this doctrine of Heraclitus may be summarized as follows: The world of continuous flux is described as a cosmos; succession is restrained, order and regularity must be attributed to it. Such a process can be comprehended only in terms of the principle by which it is controlled. This principle is not itself subject to the flux, but it exists as a static factor inherently in the process it controls or regulates. It is designated *γνώμη* (thought, purpose), since it is the permanent alone which is intelligible, it is by virtue of the existence of control that we can understand; the changing constitutes the incomprehensible.

In the systems of Empedocles and Anaxagoras there is expressed the conviction that the world presented in immediate knowledge is one stage in a continuous process, where method is dominant. Thus Empedocles: "For know that all things have understanding (*φρόνησιν*) and their share of intelligence."¹

What is, is somehow an embodiment of what was, and what will be, is somehow contained in what now exists. To account for the world of different objects, of controlled movement, is the problem of these philosophers. Hence they first proceed to maintain that change in the sense of absolute origination and annihilation is unreal.

Empedocles: "There is no origination of anything that is mortal, nor yet any end in baneful death; but only mixture (*μειξίς*) and separation (*διάλλαξις*) of what is mixed, but men call this 'origination' (*φύσις*)."²

Anaxagoras: "For nothing comes into being, nor yet does anything perish, but there is mixture and separation of things that are."³

To explain the character of all change and the existence of distinct objects, unchanging and eternal elements must be posited. Empedocles names four of these original elements, the four roots (*ῥιζώματα*) of all things,—fire, air, earth, water; and as causes of their movement, two others, love and hate, which are combining and separating forces. In addition, there is introduced a principle of measure in the mixture of elements; reason (*λόγος*) governs the peculiar proportion of parts which determines the different objects.⁴ Anaxagoras maintains that there is an infinite number of the perma-

¹ A. Fairbanks, 'The First Philosophers of Greece,' p. 186, line 231.

² *Loc. cit.*, p. 162, line 36.

³ *Loc. cit.*, p. 244, Fr. 17.

⁴ Arist., 'De Part. An.' I., l. 642, a 18.

nent existences, the seeds (σπέρματα) of all things, originally together. νοῦς (mind), an external element, produces motion in the mixture and directs the course of movement, resulting in the world of distinct objects. "And whatever things were to be, and whatever things are, as many as are now, and whatever shall be, all these mind arranged in order."¹

Democritus is impressed with the same fact of an ordered world and is likewise confronted with the same problem—the explanation of such a world. The extent to which he has surpassed his predecessors in the superiority of his conception is evidenced in the embodiment of his formulation in the mechanical theory, which, in its main outlines, constitutes the modern physical theory. Similar to Empedocles and Anaxagoras, he posits permanent elements as the primary, necessary hypothesis for all explanation. But the nature of these elements is such that, granted their existence, all other conditions may be subsequently deduced. No external forces such as love and hate and mind are necessary to cause and regulate movement; the atoms suffice for all these functions.

Concerning the nature of these atoms, we are informed that they are infinitely small, indestructible, homogeneous, impenetrable bodies, alike in essence, but different in size and form. They are endowed with perpetual motion (ἀίδιος κίνησις), whose direction is guided by no disparate principle, but is due to a principle immanent in the atoms. Thus: "λεκτέον τίνα κίνησιν καὶ τίς ἡ κατὰ φύσιν αὐτῶν κίνησις" (and there is a certain movement of those primary bodies which is a natural movement).²

The void (τὸ κενόν), for Democritus, is the logical consequent of the self-moving atoms, since to render possible motion thought is obliged to conceive the void.

Thus in the doctrine of Democritus is manifested the position that thought, in its endeavor to attain explanation, is compelled to postulate permanent elements in self-regulated motion (the atoms). With this postulate granted, all subsequent constructions are necessary deductions, thereby presenting a system logical throughout, a system which constitutes the essence of explanation.

Summarizing, then, the import of the theories of Empedocles, Anaxagoras and Democritus, we obtain the following: An inspection of these theories carries with it the recognition that the same problem inspires them all. A world, the constitution of which is described in the first instance as dynamic, must in addition be characterized as a process imbued with order, or as a movement controlled. To explain this regulated world-movement there is assumed

¹ Fairbanks, *loc. cit.*, Fr. 6.

² Arist., 'de Cælo,' III., 2-300 b.

in every case the existence of permanent elements in motion. In the theories of Empedocles and Anaxagoras, the regulating principle is embodied in elements other than the ones affected, while according to Democritus the movement is determined by the static properties of the atoms. In all the doctrines, however, the guiding principle is a constituent factor of the world, but the explanation of Democritus holds its superiority in being natural as well as cosmic, in contrast to the artificial account necessitated by the character of the elements in the theories of Empedocles and Anaxagoras.

This conclusion accords, then, with the doctrine of Heraclitus, in holding that explanation of the cosmos demands the existence of a permanent element determining the world change; which principle is contained immanently in the series of events it controls.

In Plato's doctrine of 'ideas' the existence of the rational is so emphatically affirmed that to it alone is attributed the status of the real. The flux of sensible experience, the immediate, the particular, is relegated to the realm of mere becoming (*γένεσις*), of mere appearance. Antithetically, the ideas are eternal, universal, immutable, are manifested to reason alone and constitute the realm of real being (*οὐσία*). Sensible objects are real only in so far as they 'participate' in the nature of the ideas. With the problem of the relation of these two spheres we are not here concerned.

A second feature of the ideas, and one which is no less emphatically intimated, is that of their connection and dependence. The relationship of subordination among ideas is essential to their existence and to the existence of the universe. Conceptions of measure, harmony, symmetry, order and law occupy a superior position in the structure of the world, and everywhere exhibit their dominion. Finally, supreme among ideas, the highest of all abstractions, the principle of the harmonious relationship of ideas, and thus of all 'being,' reigns the 'idea of the good.'

Thus in the 'Republic' the ideas are designated as 'fixed and immutable principles . . . neither injuring nor injured by one another, but all in order moving according to reason.'¹ That is, there is a dominating conception which preserves the subordinate conceptions in their ordered harmony, a highest rational principle, the condition of all rationality; this is that which is termed the idea of the good. What light is to the visible object, the indispensable condition and cause of its visibility, so the idea of good, *being* absolute, is the principle necessary to the existence of all knowledge and truth. It is absolute science itself, attained by 'dialectic,' which is the culminating abstraction of reason. Conceptions of number,

¹ Book VI., translated by B. Jowett.

harmony, order, may be said to be contained in it, for they are subservient to this organizing principle, while it in turn is the primary condition of their being. Hence the importance which is attached to the studies of number and calculation in the Platonic scheme of knowledge. Mathematical conceptions are essentially conceptions instrumental to fixedness and order; they maintain diverse elements within their respective limits and thus are conducive to the unity of the whole.

Evinced under a different aspect, but corresponding to the ideal good in the 'Republic,'¹ is the supreme principle of 'measure' in the 'Philebus.' Plato conceives measure as the principle of symmetry, which is due to the regulated proportion of elements in combination, and thus may be identified with beauty. The first rank in the scale of goods is assigned to measure. For the greatest good in the world is to be sought, not in pleasure, not in wisdom, but in the 'mixture' of elements, and above all in the proportion of the mixture. Measure is identical with the principle of their ordered mixture. The universe is an embodiment of this principle of measure, for 'there is in the universe a mighty infinite and an adequate limit, as well as a cause of no mean power which orders and arranges years and seasons and months, and may be justly called wisdom and mind.'² This infinite factor which enters into the composition of the cosmos is controlled by the principle of measure so that 'the assertion that the mind orders all things is worthy of the aspect of the world, and of the sun and of the moon and of the whole circle of the heavens.'

In the 'Symposium' the supreme principle is revealed under the guise of beauty. The object of all love or impulse is the beautiful, and the object of the highest passion is absolute beauty, the principle of all concrete beauties. Beauty is the result and the condition of the harmonious arrangement of constituents. It is the source of the balancing influence of proportion; it is the principle of harmony, of order, and is identical with the ideal good.

In Plato's suggestion of a probable cosmological theory,⁴ it is plainly evident that he is governed by the necessity of giving such an explanation of the origin and structure of the world as will primarily account for its organized character, for the adjustment of its parts to a consistent whole. This universe is constructed after the eternal, intelligible pattern. Harmony, beauty, order, law, must be predicated of it. Hence a 'world soul,' or supreme organizing

¹ Books VI., VII.

² 'Philebus.'

³ *Loc. cit.*

⁴ 'Timæus.'

principle, is the source of its origination. This is a world reason (*vous*), and is cognizable to reason alone. As the human soul directs the movements of the body, so this world soul or reason controls all occurrence in the cosmos and is the final cause of its existence. Briefly, the intent of this cosmological theory is the expression of the intelligibility of the universe, of the fact that it presents features which manifest a general subjection to regulation.

To recapitulate: While the Platonic dialogues present no attempt at a systematic world theory, the general theme of the doctrine of ideas, as indicated above, is the insistence upon the recognition of the universal prevalence of determination of all things, of the existence of principles regulating becoming or occurrence. These directing principles are intelligible and immutable, as distinguished from the sensible and alterable. They in turn are subordinate features of one supreme regulating principle. That is, the world must be affirmed a system, not a chaos; there is a controlling element, perceptible to reason alone, obtaining in the world of diversity, which renders it a unity, an organization. Since the nature of the sensible and changeable is entirely distinct from the immutable, this controlling principle in a sense appears to be outside the process it dominates.

Aristotle, in his inquiry concerning the fundamental nature of reality, recognizes as the most apparent and immediate presentation of experience the perpetual change of sensible things. But reflection can not pause at this incomplete analysis. Reality is not a series of unrelated particulars; it is an organic unity in which individuals function uniquely in the totality. "If there were nothing besides sensible things, there would be no principle (*ἀρχή*), no order (*τάξις*), no generation (*γένεσις*), no celestial harmony."¹ Science is an indubitable possession and bears witness to the intelligible, systematic character of the cosmos. To discover the ultimate condition of such an organic unity, to demonstrate the existence and nature of the permanently real (*οὐσία*), which is implied in its structure, is the problem of the 'Metaphysics.'

The primary reality (*οὐσία*) is always manifested in the concrete individual and constitutes its essential nature (*τὸ τί ᾗν εἶναι*). On the other hand, it must be emphasized that an adequate conception of the essential nature of a thing necessitates a transcendence of any particular embodiment, to the universal character manifested in a process (*κίνησις*). Individuals are subject to production (*γένεσις*) and annihilation (*φθορά*), and the essential nature of the individual can only be apprehended under genetic conditions.

¹ 'Metaphysics,' W. Christ, Ed., Book A, Chap. 10.

What, then, is generation and destruction, what are the characteristics of a process, are questions which must be considered.

Every concrete individual is the result of a union of matter (ὑλη) and form (εἶδος). Matter, the sum of conditions necessary to the actuality of the individual, is indeterminate. Form (εἶδος) is that which defines the indeterminate matter (ὑλη) and in combination with it results in the existence of the concrete individual (τὸ σύνολον). All existence is necessarily individual. Neither matter nor form can originate, nor can they cease to exist; the pre-existence of both is indispensable to the realization of the thing. It is the concrete individual (τὸ σύνολον) only, that which is composed of both, which can originate and perish. Now all change implies that which is the subject of change, that which subsists during differences, that which is permanent,—in a word, matter (ὑλη). Matter is capable of being both of two contraries, but at different times. Thus we have attained the conception of the primary real (οὐσία) as the essential nature (τὸ τί ᾗν εἶναι) of the individual, which is only manifested in a process. It must be noted that while the essential nature (τὸ τί ᾗν εἶναι) is universal, it is embodied in the particular; while it is static, it is contained in the dynamic.

Further, movement or change does not occur indiscriminately, but is characterized by certain limitations evinced in its operations. "Nothing, indeed, is moved by chance."¹ This is the import of the doctrine of potentiality (δύναμις) and actuality (ἐνέργεια), which is of fundamental significance in the apprehension of reality. Existence may be either potential or actual. A thing is said to exist potentially, when upon the event of certain conditions its realization or actual existence will take place. Matter (ὑλη) is potentiality (δύναμις), since it is the condition of the actuality (ἐνέργεια) of a thing. It is indeterminate in so far as its potential existence may or may not be transformed into actual existence, but it is a determining factor in limiting the nature of the actual in case of its realization. Thus, a seed is a plant in potentiality. For if the seed realizes its nature, that is, if appropriate conditions are forthcoming, the seed must develop into a plant and into nothing but a plant. The plant in relation to the seed, the potential (δύναμις), is actuality (ἐνέργεια). It is evident that actuality (ἐνέργεια) must be prior to potentiality. For while the seed, from which the specific plant is produced, must have existed prior to this plant, there must have existed another plant prior to the existence of the seed, from which it was generated. Thus it is only in the case of the particular individual that the potential may be said to exist previously to

¹ *Loc. cit.*, Book A, Chap. 6.

the actual. Generically, actuality (*ἐνέργεια*) must exist prior to potentiality (*δύναμις*), prior in every sense of the term, in time, in knowledge, and in essence (*οὐσία*), for the actual must always define the merely potential.

Aristotle has previously predicated the eternal character of movement, on the ground that if movement or change were not perpetual, something would have to be produced from nothing,—which is inconceivable. Linked to the deduction of the eternal character of movement and a consequent of it, is the affirmation of the eternal character of time.

With the establishment of the conception of reality as a perpetual process, Aristotle has arrived at the final and ultimate stage of the inquiry: What is the fundamental condition of such a process? What is the final cause of the world order? All movement and change imply that which is capable of originating movement, for if movement were not produced by something it would have to arise from nothing. This cause of movement must exist in operation (*ἐνέργεια*); for if it were merely capable of producing movement, but did not operate, it would not account for movement. 'It must not contain any potentiality (*δύναμις*) in its nature; otherwise its operation would not necessarily be eternal. 'There must, therefore, be a principle, whose very nature (*οὐσία*) is operation (*ἐνέργεια*),'¹ and which must be without matter, since it is eternal. Thus far we have derived the existence of something which is moved, and something which is the cause of movement. But, "Since there is something which is moved (*τὸ κινούμενον*) and something which produces movement (*τὸ κινῶν*), there must be an intermediate term; that is, there is something which produces movement without itself being moved, something which is eternal, and both existence (*οὐσία*) and operation (*ἐνέργεια*).'² Aristotle's next consideration is the nature of this primary reality (*οὐσία*), this eternal first mover, with the resulting conclusion that it is reason (*νοῦς*). That is, this unmoved mover operates in a manner similar to that in which the desirable and the intelligible cause movement, for that which is desired is always an intelligible object. Again, the desirable must be identified with the good, for we always desire a thing because it is good, and do not deem it good because we desire it. And the principle of will is, therefore, the good itself. Now, it is admitted that the best thing in the world is intelligence. The object of intelligence is the final cause, and this it is which is the cause of all movement and determines it as that which is loved. This mode of existence is life, 'for the operation of intelligence is life and the first

¹ 'Metaphysics,' Book A, Chap. 6.

² *Loc. cit.*, Book A, Chap. 7.

reality (οὐσία).’ The Deity is eternal life. Further, what must be the content of this divine thought? If this supreme intelligence (νόησις) is the best thing, it can only have for its object the best; but the best is thought itself, therefore it must think itself. Its operation is the seizing of itself by itself (νόησις νοήσεως), self-contemplation.

Thought and its object are identical. Nor can this object change, for, being the best, if it changed it would cease to be the best. It is therefore perpetual self-contemplation. This mode of life, which is the eternal possession of the divine reason, is only enjoyed by man in rare moments of speculative thinking. Since all things in the universe exhibit a striving for realization, a tendency toward an end, in all things is this principle immanent, although in different degrees, varying from the lowest type of existence, that of inorganic being, through the intermediate phases of plant and animal life, reaching its culmination in the rational life of man and, peculiarly, in speculative thinking.

The way in which the universe contains this principle is comparable to the relation of a general to his army, or to the organization of a well-regulated household. The general is the cause of the order in the army, and the principle of organization is the condition of the regulation of the household. That is, the universe contains this principle as the cause or condition of its unification. For while all things in the universe exercise their distinctive functions, ‘all conspire to a unique result’¹ The self-realization of the individual is identical with the process of the whole.

Gathering up the results of the whole investigation, the essential points of interest to our study present themselves as follows: The preeminent category demanded in an adequate interpretation of the universe is that of a world reason (νοῦς), which is evoked to explain the regulated or controlled aspect of reality. The data which have led to this induction, also the particular factors which the argument finds to be involved in the category, may be briefly stated as follows: Starting with the admission that the paramount empirical fact of the universe is change, a subsequent observation compels the acknowledgment of the existence of order in variation, of organic connection between events. These two primary assumptions, change and characteristic alteration, or method, lead inevitably to the conception of reality as a perpetual process, an eternal activity. The question then resolves into: What is the final cause, the ultimate ground, of this determinate world movement? The inquiry discovers it to be: The continuous operation of a principle which, while itself static, controls dynamic nature. Its method of operating is similar to the mode in which the object of desire, the intelligible

¹ *Loc. cit.*, Book A, Chap. 10.

object, determines human action; it influences as a goal to be attained, as an end to be realized. It is not an entity coercing from without, but is contained in the movement, contained peculiarly as an end toward which it tends, as an attraction to which it is impelled, as a result for which it is making. Now all individual things manifest a tendency toward self-realization, and all are constituent elements of the world process. The whole is a unity of its movements. That is, the determining principle, the static, universal element of reality, is identical with the tendency toward self-realization essentially characterizing all particular existences.

The metaphysics of the stoic philosophy proceeds from the thesis that reality is corporeal in nature and is limited to sensible existence. The corporeal must be defined with reference to a dynamic standpoint; force or tension (*τονός*) is its essential character. It presents a twofold aspect: the real is that which acts (*τὸ ποιοῦν*), and that which may be acted upon (*τὸ πάσχον*). Corresponding to this double aspect of the corporeal there exists the difference of finer and coarser in its nature. The finer substance, called fire, ether, air, atmospheric current (*πνεῦμα*), is described as mind, soul, reason; and the coarser is termed matter. But the finer is conceived as everywhere interpenetrating the coarser, and hence ultimately must be viewed as identical with it; reason is in all things and inseparable from them. God is described as both the active force and the subject acted upon, or these looked upon in union with each other.

The world must be considered as a series of events and their consequences bound together by an irresistible necessity, every occurrence of which is in conformity with this necessary order. Hence, the original productive force is called a 'generative reason' (*λόγος σπερματικός*), for it contains within itself the ground of the development of the whole world into its ordered multiplicity. It is 'a reasonable God or an artistic fire (*πῦρ τεχνικόν*), proceeding according to a certain method to the production of the world.'¹ The fixed order which governs the course of events, or necessity, is denoted by the conception of destiny or fate (*εἰμαρμένη*). It must be observed that this necessity ruling all existence is no transcendental principle operating from without, but, consistent with the stoic materialism, is inseparable from the natural force and must be identified with it.

To account for this necessary character of the world movement, for the universal causal series of events, which maintains the elements of the world in perfect balance, and is thus the ground of the whole order and unity, the conception of 'Providence' (*πρόνοια*)

¹ H. Diels, 'Doxographi Græci,' *Plac.* 1. 7. 33, p. 305.

originated. The cause of this destined order is possessed of foresight of everything.¹ That is, with the view to the end to be attained, Providence has foreseen and foreordained the whole process whose method is comprehended in the notion of destiny.

The perfection of the world system is, according to stoicism, almost too obvious to be in need of supporting arguments. Among such, however, is included the acknowledged adaptation of life to environment.

The summary of the position sketched above may be presented as follows: Stoicism maintains that the world must be described as a fixed order of events, the regulated character of which involves the existence of a guiding principle, whose divination of the end determines the character of the process. That is, supervening upon the conception of a definite movement of events, there is the conception of foreordained control. We find no basis for this idea of predestination other than the existence of absolute order, perfection. A preview of the end is thought requisite to control.

The period dominated mainly by scholastic philosophy had little need to occupy itself with inquiry into the nature of control. Since it was accepted as certain, upon authority superior to human reason, that the world was the creation of a divine spirit, its orderly structure presented no problem. Since the ruler of the universe created and directed all things with the view to a particular end to be accomplished, logical effort was concerned chiefly with the task of making the facts of nature fit in this revealed truth, rather than with the search for truth itself.

Conspicuously in the history of philosophy, Spinoza explicitly rejects final causes on the ground that they are inapplicable to reality. The philosophical fallacy of referring this category to the universe consists not merely in a failure to denote any ultimate feature of the world, but is in direct conflict with the fundamental position upon which an adequate construction must rest.

In Part I. of the 'Ethics'² Spinoza has exposed at length the origin of this misconception and the ground of its falsity. This is effected with such force and simplicity that I venture to quote a major portion. He says: "All such opinions spring from the notion commonly entertained that all things in nature act as men themselves act, namely, with an end in view. It is accepted as certain that God himself directs all things to a definite goal. . . ." As to the reason why men are so prone to adopt this opinion, he continues: "It ought to be universally admitted that all men are

¹ Diog. L., VII., 149.

² Appendix, translated by R. H. M. Elwes.

born ignorant of the causes of things, that all have the desire to seek for what is useful to them, and that they are conscious of such desire. Herefrom it follows that men think themselves free inasmuch as they are conscious of their volitions and desires and never even dream, in their ignorance, of the causes which have disposed them so to wish and desire. Secondly, that men do all things for an end, namely, for that which is useful to them, and which they seek. Thus it comes to pass that they only look for a knowledge of the final causes of events, and when these are learned, they are content as having no cause for further doubt. If they can not learn such causes from external sources, they are compelled to turn to considering themselves, and reflecting what end would have induced them personally to bring about the given event, and thus they necessarily judge other natures by their own. . . . As they look upon things as means, they can not believe them to be self-created; but judging from the means which they are accustomed to prepare for themselves, they are bound to believe in some ruler or rulers of the universe endowed with human freedom, who have arranged and adapted everything for human use . . . but in their endeavor to show that nature does nothing in vain, *i. e.*, nothing which is useless to man, they only seem to have demonstrated that nature, the gods, and men are all mad together."

In essence this contention asserts in the first instance that the ascription of final causes to nature is an anthropomorphic procedure, a projection of human methods of activity to a field where no evidence for such methods exists. Moreover, this is not all. The source of this error is to be traced to a total misconception of the nature of human volition. For that which constitutes the determining cause of actions is not a definite end, in the sense of an external goal, but directly the contrary is the case; the controlling cause of action is embodied in the impulse which leads to the action. "By the end, for the sake of which we do something, I mean an impulse (*appetitus*)."¹ Now it is consciousness of this impulse, combined with ignorance of the efficient cause of action, which gives rise to the notion of freedom in the sense of determination by an independent end, by an extraneous agency. Hence the conclusion results that final cause reduces to 'nothing else but human desire, in so far as it is considered as the origin or cause of anything.'² Therefore, in all departments of nature, human as well as non-human, final cause turns out to be a 'mere human figment.'

To disclose the ground for this conclusion, to comprehend the conception which must replace that of the traditional final cause—

¹ 'Ethics,' Part IV., Def. 7.

² *Loc. cit.*, Part IV., preface.

the opinion that the processes of nature are determined by an external agency acting according to a preconceived end—against which his polemic is directed, it is necessary to consider Spinoza's metaphysical theory.

Efficient causality, universally predicable of things, is the initial presupposition upon which any attempt to comprehend the universe must take its point of departure. Organized knowledge exists, and implies the dependence of everything upon some other thing. In the adaptations of individual things to each other, expressed in the laws of nature, is presented evidence of such connection.¹ This fundamental premise is expressed by Spinoza in the statement, "There is necessarily for each individual thing a cause why it should exist."² While the key to the comprehension of this regulated character of events implied in universal efficient causation is discovered in the proposition, "Nothing in the universe is contingent, but all things are conditioned to exist and operate in a particular manner by the necessity of the divine nature."³

That is, this determination of things can only be understood on the supposition of the world as a unitary system the elements of which contribute to and are dominated by the nature of the whole, 'the necessity of the divine nature.' The individual elements, being determined by other elements, are finite. The whole, that which can have no external determination, is independent. Hence the significance of 'substance' or God to account for this unity, the whole. "By substance I mean that which is in itself and is conceived through itself; in other words, that of which a conception can be formed independently of any other conception."⁴ With this conception of substance established, the regulated character of events is to be comprehended when they are conceived as following from the nature of the whole by an inevitable or 'geometrical necessity.' In Spinoza's terminology, "Individual things are nothing but modifications of the attributes of God or modes by which the attributes of God are expressed in a fixed and definite manner."⁵

But this whole, this unity, is a whole of constituent parts. The controlling principle of events is not an extraneous agency superposed upon them, but has its being immanent in the individual things. Moreover, according to Spinoza it is this very factor which constitutes the essential nature of an individual thing. Every individual thing is composed of two elements; of the finite or conditioned

¹ Letter XXXII., Van Vloten and Land, Ed.

² 'Ethics,' Part I., Prop. VIII., Def. 3.

³ *Loc. cit.*, Part I., Prop. XXIX.

⁴ *Loc. cit.*, Def. 3.

⁵ *Loc. cit.*, Part I., Prop. XXII., Cor.

and of the necessary, eternal (out of time relations). In so far as it is individual and a member of the temporal series, it is determined by other individuals (by transient causes). Everything, in so far as its essence is concerned, is eternal, expressive of its universal nature, its immanence in the whole.

This essential, universal, static nature of a thing is expressed in the *conatus* or tendency to persist in existence. For it must be granted that all things manifest this striving for self-maintenance, this principle of inertia. "Everything, in so far as it is in itself, endeavors to persist in its own being."¹

"The endeavor or tendency (*conatus*) wherewith everything endeavors to persist in its own being is nothing else but the actual essence of the thing in question."² When evinced in man the *conatus* or tendency toward self-realization embraces all forms of human effort and is called impulse (*appetitus*). "Desire (*cupiditas*) is merely impulse (*appetitus*) accompanied by the consciousness thereof."³

Thus it is shown that the determinate aspect of the world is the result of, or rather is identical with, that characteristic of all things which is designated a tendency toward self-maintenance, self-realization. This it is which constitutes the static element in the temporal, finite order. This it is the function of reason to perceive, while to imagination is allotted the perception of things in their spatial and temporal relations.

Now have we arrived at the conception which must replace the rejected final cause, whose inconsistency with this interpretation of reality is clearly apparent.

Recapitulation. The presupposition of a dynamic world described by efficient causality necessitates for its ultimate comprehension the determination of all events or objects. The guiding principle of the cosmos is evinced in all things as a tendency toward an end. The end can not be conceived as an external goal, but must be characterized a self-realization. Otherwise expressed—there is in everything that which makes for what is beyond itself, but is intended, or to an extent involved, in its present existence. It is this immanent direction of change, this static element in all the variety of events, which lies at the basis of the controlled aspect of nature.

To Leibniz, imbued as he was with the results of modern scientific investigation, the fundamental philosophical problem presents

¹ *Loc. cit.*, Part III., Prop. VI.

² *Loc. cit.*, Part III., Prop. VII.

³ *Loc. cit.*, Part III., Prop. IX., note.

itself as the necessity for showing that the mechanical conception of cosmic processes requires for its ultimate comprehension the teleological view of nature. Reason can recognize no infringement upon the universal application of the mechanical theory in the perceptible world, the world of matter and motion, in which the actions and reactions of things permit formulation. But the order of events so described is not ultimately apprehended. The mechanical conception of nature is not self-explaining, but demands for its completion a further interpretation. Thus Leibniz asserts that he has found the means of harmonizing the opposition of mechanical and metaphysical systems in his discovery 'that in the phenomena of nature everything happens mechanically but at the same time metaphysically, but that the source of the mechanical is in the metaphysical.'

The perceptible world must be regarded as a phenomenal world, whose inner content and real nature must be conceived as force, activity, life. The dynamic, as contrasted with the static, given in physical description, constitutes the essential nature of things. And the doctrine of the 'monads,' which Leibniz has advanced to the end of disclosing the ultimate ground of the phenomenal world, is a theory of force, activity. In anticipation of the theory, we may note that the notion of 'force,' 'activity' as employed by Leibniz is equivalent to self-originated change, and that in essence the monadology may be interpreted as a theory of regulated movement or change. To make good this position we must have recourse to the doctrine in some detail.

The ultimate elements of things, or simple substances, are units of force to which extension does not pertain. These forces or 'monads' are the real atoms of nature, and are original and indestructible.¹ Every monad is an individual, is distinct from all others, and is incapable of being influenced by anything extraneous,² 'for the monads have no windows through which anything could come in or go out.' Extended bodies are the phenomenal effects produced by aggregates of monads; only the effects of force are perceptible. Now all created beings, and consequently the monads, are by their very nature subject to continuous change.³ But in addition to the fact of change, there is a method of change, that is, a principle controlling the series of occurrences.⁴ This is the significance of denoting the monads as characterized by 'perception' and 'appetition.'

¹ 'Monadology,' § 1-7.

² *Loc. cit.*, § 2-9.

³ *Loc. cit.*, § 16.

⁴ *Loc. cit.*, § 12.

For change is such that it involves an unchanging element, a static factor. There is a principle of unity, of connection, in the plurality of states or representations of the monads which constitutes it one monad. Hence force, or the intensive nature of things, manifests itself in 'perception.' "The passing condition which involves and represents a multiplicity in the unity or in the simple substance is nothing but what is called 'perception.'"¹ This unifying principle is also designated 'representation,' it is an ideal conception; that is, it is no phenomenon divulged in the material, perceptible world as such, but rather constitutes an intelligible principle. Thus every monad at every state contains the whole world in the sense that it 'mirrors the world.'

Further, the principle of change is determined in its operations. There is a particular order in the succession of states of the monad. Force is evinced in 'appetition,' 'desire.' "The activity of the internal principle which produces change or passage from one perception to another may be called appetition."² Now this determining principle is spontaneous, for the monads can not be affected from without. "Each carries in itself the law of the continuation of the series of its operations."³ This self-active principle is evinced as a tendency to pass from one state or representation to another, and this tendency is directed toward the self-development of each monad. But Leibniz must account this controlling principle in each monad as *one* principle in all nature. So each monad is potentially the whole universe and its process of unfolding its inner nature is identical with the process of realizing the universe. Appetition expresses this tendency to self-realization. Since each monad represents the same universe, its differentiation is due to the fact that it is a particular phase of representation, a particular point of view; that is to say, it is a certain degree of intensity of the world force.

But by definition the monads exclude mutual influence. However, the material world to be interpreted is a realm where reciprocal interaction is the law, and there must be a unity as the ground of the whole. Confronted with the problem of explaining the correspondence in the functions of the monads, the problem of accounting for the whole from the standpoint of the individual, Leibniz resorts to the further hypothesis of a 'preestablished harmony.' Each monad has been so determined originally that its spontaneous activity bears the character of a part in a whole. Its natural and independent development appears to be that of an element in a system. The final cause or origin of this relation of

¹ *Loc. cit.*, § 14.

² *Loc. cit.*, § 15.

³ Letter to Arnauld, 1690, Erdmann Ed., p. 107.

preestablished harmony is an uncreated substance, a central monad or God. "God, alone, is the primary unity or original simple substance of which all created or derivative monads are products."¹

From the above sketch, we conclude that the import of Leibniz's teleological conception may be summarized as follows: The mechanical theory of the world demands for its ultimate interpretation the conception of reality as a process, a specific activity, a controlled change. The determination of the course of events is inherent in the constituent elements; it is manifested as a tendency in all things toward a result. The description of the method of occurrence as a self-development of things, as an unfolding of a specific content, is a mode of expressing this tendency or determinate variation. The function of the doctrine of preestablished harmony is the establishment of the identity between the cosmic principle and the self-determination of individual things.

With the theory of Leibniz we must conclude our investigation of the cosmological conception, since with this system terminates any extensive interest in metaphysical inquiry. Henceforward philosophical effort is influenced by the problem of method, and the question of cosmical control is either totally abandoned or relegated to a minor position in systematic thought.

A review of the various cosmological conceptions of control which have been presented discloses certain salient points of agreement. The two primary assumptions from which all the theories take their point of departure are, first, the fact of a dynamic world and, secondly, a feature which is not so readily apparent to observation and which in the earlier theories is indefinitely designated as order, regularity, harmony, etc., while in the modern accounts it is more precisely described in terms of efficient causality or of the mechanical theory. To explain this characteristic of the world change it is deemed necessary to conceive nature a course of events which is determined, in a word, a process. The requirements of logic demand that the controlling principle be contained immanently in the series of occurrences which it influences. It is a universal in the particular elements, a static existence in the dynamic flux. In the doctrines of Aristotle, Spinoza and Leibniz (most thoroughly of Spinoza) there is exposed the mode in which this principle exists as a factor immanent in the world it constitutes a process. In all individuals it is manifested as a tendency to something beyond immediate exist-

¹ 'Monadology,' § 47.

ence, and by virtue of this relation effecting conservation gives to what would otherwise be discrete happenings the character of results.

On the other hand, there is discovered the view, peculiar to certain theories (Platonism, stoicism, scholasticism), which locates the source of cosmic control in an external principle. In stoicism and scholasticism this foreign agency operates by means of a preconceived end. The justification for this opinion has been discussed.

CHAPTER II

EPISTEMOLOGICAL

BEGINNING with Locke, with whom the central interest of philosophy is transferred to epistemology, conceptions of control assume a different status. Now metaphysics as the field for the solution of philosophical problems is abandoned. A theory of knowledge is the only road to the desired goal. If thought would be purged of the inconsistencies with which it had been permeated during the dominion of scholasticism, a new method of procedure must be followed. An inquiry into the possibilities and limitations of knowledge must prelude a search for truth. With the rise of epistemology and its fundamental assumption of dual existences, there emerges the problem of explaining the principle of connection at the ground of the world order from this altered standpoint. With experience and knowledge conceived as a relation of some sort between a psychological or mental existence on the one hand and an objective or cosmic reality on the other, there is introduced the question as to the *locus* of the unifying principle and its consequent characteristics. If all knowledge is ultimately derived from sensations, and if sensations as the merely particular are incapable of supplying the principle of connection involved in the complexities of knowledge, then mind, a subjective activity, must in some way be the source of the synthesis. Thus in the theories of Locke, Berkeley, Hume and Kant, in varying degrees and modes mind is held to furnish the principle of control underlying the world system. For without this principle the world would have to be conceived a chaos.

On the other hand, these writers also display an interest in the teleological conception of nature. But having placed control in epistemology, they were compelled, in the consideration of design in nature, to resort to speculative accounts.

Locke's position with respect to the source of unification is indefinite. Starting from the initial presupposition that the objects of knowledge are confined to ideas, and further that all ideas are traceable to sensations which in their first appearance are separate or detached, Locke vibrates between an internal and external principle as the origin of their combination into the complexities of knowledge. Now the source of synthesis is attributed to the operation of a subjective activity, mind. Knowledge is defined as 'the perception

of the connection and agreement or disagreement of any of our ideas.¹ Again, the principle of combination is referred to an extraneous, metaphysical source variously denoted as substance, the Deity, nature, when knowledge is asserted to be dependent upon the agreement of ideas with 'things without the mind.'² But the interpretation which influenced the development of thought immediately after Locke is the doctrine that the subjective activity originates the arrangements of knowledge out of sense-derived ideas.

When Locke comes to account for the purposeful aspect of nature, his position is a reconciliation of reason and theology and inclines to the deistic conception of God and what is known as the physico-theological argument or the argument from design. This view maintains that there is a mind outside of nature, an intelligence and will directing it according to a preconceived plan. According to Locke, the existence of God, a supreme will and intelligence, is an inference based upon the nature of the world and of ourselves. Of our own existence we have an intuitive knowledge, and of things a sensible knowledge. Locke accepts without question the order and regularity apparent in the world, and on the basis of the contingency of our own existence infers the existence of God. Thus, the argument runs: Since our own minds are dependent and not self-produced, and also since the cause of all things can not be lacking in any existing quality, this supreme cause or God must be of our own nature, mind and will. As to just what the significance of mind is, Locke is not clear; what is made evident is that it is a notion subjectively derived and then assumed to account for the regulated character of external nature.

Berkeley, developing to a further stage Locke's thesis that all knowledge is limited to ideas derived from experience, discards substance, which Locke had retained as the material substratum of ideas, and with it any objective principle of connection. For we possess no idea of unity, but only a 'notion' of the same, hence there can be no external reality corresponding to it. The corporeal world is in this way reduced to a system of ideas, and hence for Berkeley the problem of its purposive character presents no difficulties. This system of ideas constitutes a cosmos. There is change and there is order of succession in the change. Since it is obvious that our own minds or wills do not control these ideas, Berkeley proceeds to infer the existence of an incorporeal cause or spirit as the author of the world harmony. What are known as laws of nature are really laws of this spirit. This notion of a supreme mind is based upon the

¹ 'Essay,' Book IV., Chap. I., Sec. 2.

² *Loc. cit.*, Book IV.

doctrine of a subjective agent, a spiritual entity in which ideas inhere, which Berkeley had retained when rejecting a corporeal substance.

Hume, carrying to its logical outcome the thesis that all ideas are ultimately traceable to sense impressions, finds that upon this basis there can exist no formative principle of events, no essential unity, no real knowledge beyond immediate sensations and the memory of these.

After banishing Locke's material substance, Berkeley had still held to a substantial, spiritual entity. Advancing a step farther along the same line, Hume shows that the existence of mind, a substantial unity, is an untenable hypothesis. For no impression from which this idea arises can be discovered; analysis discloses what is designated as mind to be a mere 'bundle of perceptions,' with no principle of connection to constitute a unity. Similarly, necessary connection as an essential constituent of the law of causality turns out upon examination to be a mere figment of the imagination, a gratuitous construction, with no basis in reality. Experience presents elements in contiguity and succession, but perception reveals no idea of any necessary connection. With the abolishment of any essential synthesis of the contents of ideas, or the objects of knowledge, Hume is compelled to seek elsewhere for the explanation of what must be accorded complexities of our experiences and the apparent order and uniformity of nature. For reflection can not conceive experience as a chaotic jumble of elements or as an indiscriminate sequence of events.

This explanation of the unity prevailing in the practical world is gained by reference to the psychological processes of association and habit. In the case of the law of causality, repetitions of sequences give rise to the *feeling* of necessity that upon the appearance of one event a particular successor will follow. Thus necessity reduces to a habit of human nature, a tendency of the mind to pass from one event to another, but indicates no connection between the events themselves. It is a relation between ideas as psychical existences, not as contents or objects of knowledge. No real consequence can be demonstrated; arbitrary sequence is all that can be asserted. Hume stops with this negative conclusion; an inquiry into the logical ground of this belief in necessity does not suggest itself.

With respect to the teleological conception of nature, Hume discards the compromise between science and religion as effected by Locke and Berkeley. From the standpoint of an empirical epistemology the argument for design can not be maintained on rational grounds. The assertion of the absolute order and harmony of the

world is unwarranted by the facts of experience. Apart from strictly rational considerations Hume does find that the view of a supreme force regulating the events of the world appears to be pertinent to nature.

Kant's position is fundamentally influenced by the acceptance of the two-world theory of experience, although its form is an essential modification of any hitherto expounded. In accordance with Hume there is the initial assumption of an external reality presented through the medium of sensation. But Hume's consequent conclusion, the ultimate reduction of all knowledge to the passive flux of isolated sense impressions, can not be accepted. Our experience of objects is an indubitable fact, knowledge exists, science exists. Necessary connection, principles of unification, synthetic processes, not only *do* take place, but *must* be operative, since they constitute the very conditions of knowledge. Without a formative principle no object of knowledge would be possible. Since this synthesis, which must be accorded universal and necessary, is incapable of being derived from sensation, marked as this is with particularity and contingency, Kant concludes that it must be referred to the activity of an internal subjective element, mind.

External reality in itself can never be an object of knowledge. The office of sensation is limited to furnishing the stimulus which excites the formative activity. That is, by means of sensations is presented the raw material, absolutely unformed, upon which the shaping process operates, and wanting which it can not be effective. Even to recognize a sensation as such involves relationship, synthesis. To determine the various modes of synthesis which constitute the objects of experience and which are the preconditions of all science is the task of the 'Critique of Pure Reason.'

The primary, general conditions of any object at all are the forms of intuition, space and time. These are the pure forms of perception, the manner in which the theoretical reason operates to combine the manifold of sensation into perceptions.

But nature is not a mere aggregate of perceptions. The existence of any particular object as well as the relation of objects with each other involves a further stage of synthesis. Mere flux, alternations of sensations, could never result in an object or knowledge. For these particulars to be held together, an abiding element is required, a principle of connection, an intelligence. This it is which constitutes the 'ego,' 'the transcendental unity of apperception,' 'the self.' That faculty whereby the creative activity combines the elements of perception into the complexities of the world of experiences is termed the 'understanding.' The 'pure understanding' sup-

plies the concepts which are at the basis of those relations of objects described in physical science, the concepts which underlie the system of the world. Thus it may be said the 'understanding prescribes laws to nature.' The objective world of experience is a phenomenal world, a construction of the theoretical reason.

In agreement with Hume, Kant denies the conception of design as a principle implied in the constitution of nature. On theoretical grounds the validity of the deistic conception is incapable of being established upon the basis of the nature of this objective world. But as a regulative conception, as a principle of the reflective reason, Kant finds the teleological conception useful and justifiable. That is, it is a way of considering things which the mind finds indispensable to a complete interpretation of the world. To understand nature, our intelligence must view it as if it were regulated by design. Thus the conception has its existence only in the mind, it is subjective in the Kantian sense.

From the consideration of this position it is apparent that if we would determine what must be regarded as rationally valid in the teleological conception, or what in the Kantian philosophy must be deemed a principle of the constitutive reason, the query which will guide us resolves itself into, What are those features inherent in the objective world (objective in the Kantian sense) which permit and compel this way of viewing things if they would be comprehended?

In the 'Critique of Judgment' Kant analyzes the concept of purpose to some extent, and marks the distinction between *Zweck* (end) and *Zweckmässigkeit* (adaptation to end, or purpose). *Zweck* (end) is a conception which contains the ground of the activity of an object. "*Zweckmässigkeit* (purpose) is the agreement of a thing with a character which is only possible in accordance with ends."

Kant suggests that it is analogy with our own psychological activity which lies at the basis of the conception. Now, in two instances is there presented this characteristic which must be regarded as purposive; in the unity and uniformity of the world, and in organic beings.

In order that the world may be known, in order that scientific research may proceed, it is necessary to conceive nature 'as if a reason were at the basis of the unity in multiplicity manifested in her empirical laws.'¹ That is, an activity analogous to human causality is postulated to render intelligible the fact of control which is implied in the view that the world is a systematic unity.

Again, organic activity must be regarded as regulated with reference to ends since the parts and the whole in organic beings can

¹ 'Critique of Judgment.'

not be understood independently of each other. The production of the whole organism is determined by the parts and, conversely, the production of the parts is influenced by each other and by the whole. This reciprocal determination, Kant holds, is rendered comprehensible only on the supposition of an intelligence which acts as if it had a purpose in view.

Consideration of both these instances of purposiveness, the unity of the cosmos and organic products, leads us to conclude that that characteristic which is allowed to be an essential element of the objective world, and which the subjective conception is evoked to explain, is a connection of dependence among elements, such a relation of particulars as is conducive to a definite result. What the position further maintains is, that to comprehend this fact it is requisite to entertain a conception analogous to psychological activity, that is, a determination by means of a preconceived idea. It is this opinion which has led Kant to designate the conception of purpose, as applied to the world, subjective. What the above analysis of purpose has warranted us in retaining as an essential trait of the world is the fact of control as a specific relation between events, which relation is the ground of its systematic nature. It must be remembered, however, that the objective world according to Kant is really a subjective construction, hence this determining element in nature in the last instance is the work of mind.

The post-Kantian idealistic movement, developed in the systems of Fichte, Schelling and Hegel, destroyed the transcendent cosmic reality which Kant had maintained as the cause of sensations, the unknown matter which was indispensable to the exercise of the activity of reason. Hence the entire phenomenal world is referred to consciousness or reason, either as its creation or as existence identical with it, according to the particular view of consciousness entertained. In the philosophy of Fichte, the transcendent absolute ego determines itself in its unconscious creation of the non-ego or external object. Control of the object becomes a determination of self. Schelling conceives both ego and non-ego, mind and nature, to be the product of a superior, mysterious transcendent principle, the identity of contraries. Finally, as a last phase of this movement, Hegel asserts that neither mind nor matter is transcendent; both are simply successive stages in the one process of reality. The world of experience is just this evolution of consciousness; reason is developing reality. Consciousness, however, is not identical with any human faculty, as Kant had asserted it to be, but constitutes the law of all being. It is the same principle which legislates in both nature and mind, although conscious of itself in the latter. Thus

does the principle of order become the ground of the objective, the external, which it determines; and its operation is the affirmation of the other and the subsequent control of it by the inclusion of its product within itself.

Coming down to the present-day philosophical movement known as pragmatism, we find a fundamental importance attached to the notion of control. This theory advances upon the presupposition that reality must be identified with experience, and that experience is dynamic and continuous in its movement. Moreover, the experience process is not adequately described as a mere flux of the given, an aggregate of successive events, a conjunction of accidentals. The movement is an evolution, each event is a stage in a process, one occurrence is the outcome of another; that is, determination and restraint are essential characteristics of it. The urgency of recognizing and accounting for control is manifested in the fact that it has given rise to one of the main problems of pragmatic epistemology, namely, to explain the determination in an experience process without recourse to any principle extraneous to that process. Direction of the experience movement is predicated, and the element which exercises this guiding function must, according to the basal assumptions, be wholly immanent. Thus experience is conceived to be a *self*-evolving process, a *self*-maintaining activity, and the controlling factor must be sought within these limits. Now, that element which guides activities without going beyond the boundaries of experience is, according to pragmatism, knowledge. Hence knowledge is essentially an instrument, an instrument of control whose office is the directing of the movements of experience in so far as these are other than accidental. Thought is one among other functions of experience and exhibits its peculiar nature in determining the other characteristics. It follows as a consequence of this doctrine, that irrespective of a life process control is meaningless.

In order to determine the significance of control in this theory, to discover just how thought operates as control, let us examine the pragmatic account of knowledge.

It is maintained that since knowledge is essentially instrumental, a function in the process of experience, the consideration of its genesis and consequence is imperative for its comprehension. Thought always arises in a situation which may be described as unsatisfactory, the elements of which are in tension one with another. In order that activity may proceed, a reorganization is demanded. To meet this want the idea arises as an interpretation of the discrepant situation, as a defining of the incompatible elements. Now it is the very essence of such interpretation to lead to a harmonious

or unified experience. For in making explicit the end which must be attained if activity is to go on, there is involved at the same time the tendency toward the realization of the goal conceived, the directing of activity to its achievement.¹

Thus we obtain the thesis that the idea, being primarily a plan of action or purpose, controls movement, in its quality of reference to an end. The idea as purpose is coincident with the tendency toward a specific future experience or event, as contrasted with a mere happening. Control, then, reduces to a relation between two events of experience such that one (the idea) brings about the existence of the other (a fulfillment).

In this description of the thought function it appears that there are two determining circumstances exclusive of knowledge. The idea itself is somehow conditioned by the antecedent biological situation, and the experience, which is the outcome of the purpose, is likewise dependent upon some additional fact not contained in the idea. "The conditions out of which the idea as purpose arises determine also the fulfillment possible." That is, the idea implies a prior fact, transcendent of experience, by virtue of which its character is determined. And again, the idea, arising in this manner, is only determinative, and constitutes a knowledge if it issues in a completing, satisfying experience. For the objective is such by virtue of the fact that it controls. Now if this resulting situation is not wholly dependent for its character upon the idea, it is obviously influenced by a factor independent of experience. Since it is only upon the actual occurrence of the anticipated event that the idea is said to be effective, it seems that knowledge as control is itself influenced by some extraneous element. Just what part this influence plays, its relation to knowledge as control, or the expression of any implications it may contain, must be deferred to a later stage of this discussion.

The general account of the thought process sketched above embraces all varieties of knowledge, both the critical or scientific and the barely cognitive processes. Since the more involved operations may include and emphasize features which are lacking in the simpler cases, it would facilitate the attempt to reveal the essential character of control as exercised in knowledge if attention were confined to the type in which the least possible degree of complexity existed. Subsequent consideration of the more involved operations would disclose any additional characteristics introduced.

In a recent article by Professor Dewey there is presented an analytic description of a knowledge as such.² In this account the

¹ Gathered from 'Studies in Logical Theory,' John Dewey.

² 'The Experimental Theory of Knowledge,' *Mind*, N. S., Vol. XV., No. 59.

distinction between a *cognitive* and a *cognitional* experience is emphasized and their differentiæ exposed.

That which is denominated a cognitive thing is the simplest type of a knowledge. Let us consider the concrete case cited in illustration of a cognitive experience: a smell which leads to action, the plucking of a rose. The experience which designates this sequence of events an evolution, the final act a result of the first occurrence, is a cognitive experience. Meaning, 'intellectual force and function' are attributed to the smell by virtue of its relation to the subsequent event, the presence of the flower. The smell means the flower. Now it is important to lay stress upon the fact that it is only retrospectively or *ab extra* that meaning or purpose is attributed to the smell. The smell in its original existence was not experienced as a smell, was not an idea, but mere fact. The idea knows the smell as smell because it is related to some other thing, the flower. With this description in mind, our problem takes the form of determining the *locus* of the controlling principle in experience, of discovering in just what the directing function inheres. Undoubtedly it is the cognitive experience (the retrospective experience) which *affirms* the determining relation between the two elements, the smell meaning the rose. But does it not make this assertion, is it not a knowledge, because of its recognition of a transitional experience independent of the knowledge of it? The controlling element, then, must reside in the immediate transitional experience, the connecting link between the elements, and not in the cognitive experience. Knowledge appears to be grounded in control, in the relation, rather than control in knowledge.

Up to this point, then, we find that there is no question of thought as control. The instrumental function of knowledge is yet to be evinced. To revert to the illustration: the smell recurring may consciously intend the flower, may 'mean to mean' a certain terminating experience. This 'cognitional experience is contemporaneously aware of meaning something beyond itself'; it sets up an ideal to be realized. That the meaning so intended is actually effective can only be affirmed after the resulting experience has verified it. When so validated the idea is held to be true. According to the experimental theory, a true idea is one whose conscious intention has been found to terminate in realization. Our query now becomes, Just where does the transformatory or reconstructive function of thought enter in this second type of a knowledge? The answer is, In its capacity for supplying meanings which may be purposeful. This it is able to do because of its predication of determinations which have been operative, *i. e.*, because of a previous

cognitive experience. Knowledge serves to lend direction to the process of experience in so far as it enters into the intentional purpose or meaning. The content of a cognitive experience may be made, consciously made, the incitement to action, and is thereby instrumental in determining experience to the extent that it is capable of expressing ideas which will operate; and to just this degree is experience 'a consciously effected evolution.' That an intended purpose will be effective can never be a matter of certainty; probability, in varying degrees, is the utmost which can be legitimately affirmed.

As a result of this analysis, it appears that knowledge as a knowledge never directly controls experience. An idea in functioning presents no elements which can be distinguished from determination in experience, which was unaccompanied by any awareness of its constraining nature. As an impulse to a specific action the idea regulates that movement in a manner similar to that of any non-logical impulse. In a secondary sense knowledge may be said to be determinative in so far as it indirectly influences a future impetus to action, by reason of its capacity for supplying the content of ideas and thus modifying impulse. That is, knowledge controls in so far as it reflects and harmonizes with a transcendent determination. Experience is a *self*-determined process to the extent that there is a recognition and utilization of an extraneous control.

CHAPTER III

BIOLOGICAL

IN times past and present theories of vitalism have been and are asserted which claim to account for certain peculiarities of the organic world which are incapable of explanation by mechanical principles. While the formulations of the theory have undergone modifications with the development of biological science, the logic of the argument remains generally the same. Thus in earlier times a special vital force was presupposed to account for such features as the orderly structure of the living organism, the process of development and the adaptation of organ to function. This specific energy constituted something supermechanical in nature, not subject to the laws of matter and motion, and, according to certain formulations, accomplished its work through a preconceived ideal.

But vitalistic theories, both those which have ceased to attribute a human intelligence to the extramechanical agent and the earlier formulations, are prone to be stigmatized as unscientific. What, then, is the ground of those objections which regard such reasoning as a false step in scientific procedure? The import of these criticisms, I take it, may be stated as follows: Vitalism must of necessity be worthless as a means of explanation since its method of procedure contains within it an inherent inconsistency. With the exposure of this inconsistency, vitalism as a scientific theory falls to the ground. It is due to a failure to appreciate the significance of mechanical explanation. Let it be granted for the sake of argument that there are distinguishing organic features, such as, for instance, the harmonious functioning of the organism. What vitalism presupposes in this case is an entity to account for such an arrangement of the material constituents as induced such a result. That is, in lieu of the forces which describe physicochemical processes, it asserts a principle which it holds to be specifically different, but which actually is assumed for the purpose of exercising the same function. Thus vitalism, in so far as it is explanation, resolves into mechanical explanation, and as such ceases to merit attention as a different method of interpretation, but must stand its ground similarly with any scientific hypothesis.

However, if vitalism proves superfluous as a method of explanation, it may contribute something of value if it calls attention to what have been considered those distinguishing features of living things

which have suggested the need of explanation specifically different from that obtaining in non-vital nature. If the development of biological science, with its increased accuracy in the description of vital processes, has tended to remove the ground for the assertion of peculiar vital characters, yet the investigation of them is of service in the present study since it has been conducive to the analysis of those features which they were invoked to explain.

Thus, it is the contention of a modern vitalist¹ that the creative synthesis of the organism, its harmonious functioning, is a unique attribute of living nature, in that it implies the possession of qualities by the whole which the parts do not display. The objector opposes, and we must add justifiably so, that this constitutes no criterion of difference between the two realms of nature. Every complex, inorganic as well as organic, possesses qualities which are wanting in its constituent elements. The attributes of water are essentially different from those of hydrogen and oxygen.

The subject of development may detain us somewhat longer, not because it requires an extramechanical entity to render it comprehensible, but because it has not so readily been paralleled in physico-chemical description. A recent statement of an opinion of the general drift of research with respect to this subject may help to disclose the nature of those facts of which theories of development must take account. To quote: "The germ consists of two elements, one of which undergoes a development that is essentially epigenetic, while the other represents an original controlling and determining element. The first is represented by the protoplasm of the egg. The second is the nucleus, which, as I have attempted to show, must apparently be conceived as a kind of microcosm or original preformation consisting of elements which correspond, each for each, to particular facts of characters of the future organism."²

We are not here concerned with the problem as to whether epigenesis or preformation or both be the proper explanation of development. What is to be observed is, that all the theories are advanced to account for a particular series of events, such a series as must be described as a process of development. That is, these theories indicate the necessity of explaining mechanically (*i. e.*, in terms of matter and motion) what must otherwise be conceived as a process controlled and determined. The future organism is somehow the resultant of original elements. There is an identical factor in the individual stages which constitutes them a connected series. Should development take place by the addition of parts (epigenesis), yet each stage of growth is not merely new, not absolutely unrelated to

¹ Driesch.

² E. B. Wilson, 'The Problem of Development,' *Science*, February, 1905.

the foregoing, since this new must be looked upon as conditioned to some extent by the prior stage; thus the changing series of states is designated an evolution.

If it prove that development is capable of analogy in inorganic nature, the fact of development remains unaltered and, if the above conception be sound, must stand.

But it is primarily in the explanation of the phenomena of adaptation that biology has emphasized its peculiar need for the employment of the conception of purpose. To the recognition of this peculiarity (whatever its nature may turn out to be) may be traced the impetus which leads writers on natural theology to employ it as a basis for the 'argument for design.' When Paley compares the eye to a human contrivance, it is its adaptation, its capacity for seeing, that makes the analogy hold. Its structure is an adjustment to a specific environment.

For a profoundly suggestive philosophical treatment of this subject, I refer to the volume of Professor Brooks.¹ In it the author contends that the distinction between the works of non-vital nature and those of life is useful and justifiable, and finds that distinctive character to be expressed by such terms as fitness, use, adjustment, adaptation.

To quote: "Living things are preeminently distinguished by what is best expressed by the word fitness; they are adjusted to the world around them in such a way as to force us to believe that the use to which their organization is put has in some way been the controlling factor of their organization." Darwin has described the method according to which adaptation has arisen, when he expounded his theory of the origin of species by means of natural selection. But in presenting this mechanical explanation of adaptation he has not disposed of fitness, and this is the fact to be interpreted.

Now fitness must be apprehended as a relation, a relation between the responsive organism and external nature, such as tends to preservation. And it must be observed that it is not primarily the individual that exhibits the favorable response which is benefited by it, nor primarily the organism in which the adjustment manifests itself which is preserved from injury or destruction; but otherwise. The impulse which leads to reproduction and achieves its end, the perpetuation of the species, frequently does so at the expense of the parents' life. To cite one among numerous concrete cases of migration, we may refer to the salmon. In the prime of its strength it leaves its abode in the ocean and, struggling against almost insuperable obstacles, finally arrives at the mountain stream which is to

¹ 'The Foundations of Zoology.'

serve as the breeding-ground. There, having accomplished its end, the establishment of offspring, its life is done. Nor does this present anything anomalous in living nature. Thus it is maintained: "In all cases, the structure, habits, instincts and faculties of living things, from the upward growth of the plumule of the sprouting seed to the moral sense of man, are primarily for the good of other beings than the ones that manifest them."¹

And here we are confronted with an important point. Fitness involves the continued existence of that which is fit. If the being which survived the favorable response were not in some sense identical with the one which manifested the useful quality, there could be no such thing as adaptation. Since, as stated above, the individual whose survival is due to a favorable attribute is frequently other than the one possessing the useful quality, in what does this identity reside? Evidently, in the species. The relationship of adjustment is exhibited in the series of individuals, but not in any single individual of the series. Similarly, when we predicate fitness of an individual organism, the continuity inheres in the variety of changing instances of the individual life, and in particular cases underlies what is known as personal identity. That is, fitness involves genetic continuity, a permanent factor, an intelligible principle in the history of living beings.

Should the particular means by which species have been brought about prove to be 'mutation (the sudden and spontaneous production of new forms from the old stock)'² or the gradual accumulation of fluctuating variations, the above position is unaffected. Both theories endeavor to account for adaptation³ and what it implies, progressive evolution in the organic world, a process wherein only the survivals count; these accumulating in the course of its procedure constitute a history in living nature.

The fact that change in living nature must be conceived to take place under certain limitations constitutes the foundation of the problem of heredity. A theory of evolution must explain two classes of facts, first, the production of new forms of life, and, secondly and primarily, the repetition and preservation of type. The particular means by which heredity is effected appears to be an unsettled question of biology. It is held, on the one hand, that it is impossible to explain the repetition of ancestral form on the theory of the inheritance of individual adaptation to environment; and again, it is maintained by some scientists that natural selection is inadequate to explain the whole phenomenon. What this moot position does indicate

¹ *Loc. cit.*

² De Vries.

³ Adaptation has been used to signify favorable variation.

is the fact that all the theories of heredity find it necessary to explain the conservation of type, the fact that the new in living nature is not entirely new, but is a transformation of the old.

To sum up the results of the discussion: There is in living nature that which must be conceived as a tendency toward the attainment of something beyond the present individual's existence. This tendency, involving a permanent element in a changing series, makes for accumulation, thus resolving the succession into a history. Otherwise stated, there is a principle of control at the basis of the organic world which gives it the character of a progress or evolution. Organic evolution is an indication of a determining factor since it involves conservation or limiting conditions of occurrence.

CHAPTER IV

MECHANISM

THE modern scientific view of nature repeats the observation of Heraclitus of old,—all things change. But that the flux is calculable, that happenings take place in such a way that prediction of them is to an extent possible, that laws of change may be formulated, these facts constitute the very foundation of physical theory. Mechanism is the scheme for describing and explaining physical processes, and the existence of the mechanical theory of nature presupposes and involves a certain determination of occurrence, a regulation in change. In fact, mechanism is in essence a detailed expression of control. The fundamental postulate, upon which science advances, is that there is some constant amid all variation. For did mere change, unrelated elements, embrace the whole of the physical world, science would be impossible. Did observation disclose nothing permanent in alteration, laws of nature could not be constructed. Scientific investigation no less than ordinary observation asserts the interdependence of phenomena, and natural laws are formulated to describe these connections.

Let us see how physical science conceives control (tacitly, if not explicitly), and to this end examine some of the actual constructions as embodied in its basal concepts and principles. Before entering into this, however, since the object of physical theory generally is the formulation of laws, it is pertinent to inquire, What is the significance of a natural law?

Modern writers on the logic of science have called attention to the economical and practical character of natural laws. As an abridged statement, a concise arrangement of a large number of facts, a law facilitates thought in its endeavor to attain a comprehensive grasp of things. The data of which a law is an abstract formula are relations which obtain between elements or groups of elements. Observation discovers particular sequences of happenings, and a law in its descriptive quality resumes these sequences in a simple formula. In order that such a *résumé* may be effected, there must have existed as a prerequisite repetitions of similarities in the phenomena observed. That is, there is a constant factor in the variety of particular sequences and it is this identical feature which a law enunciates and which constitutes a specific relation.

It is obvious that a relation of succession, the outcome of empir-

ical data, does not exhaust the character of a law. A law implies such a sequence to be a consequence. The later happening is viewed as a result of a previous occurrence, and this in turn is regarded as a determining condition of the subsequent event. Otherwise stated, a law formulates a specific method of change. To this property of expressing a determining principle, the practical nature of a law may be traced. Thus one writer defines a law 'as a constant relation between the phenomena of to-day and those of to-morrow.'¹ Not only a past order is described, but prediction of future events may be made with confidence, and all such prophecy has its ground in the principle of uniformity. For every law is a generalization and as such involves the postulate of uniformity, and uniformity is simply an expression of the logical necessity for predicating control in the processes of nature.

It has been said that science makes legitimate prediction possible, and experience in the past has served to justify such prophecy. Now we have observed that all statements with regard to the future have their basis in the postulate of uniformity, and the question arises, What is the foundation of this conception? Is there, as it has sometimes been affirmed, any proof of the view that no arbitrary change can take place in nature? The answer to this query leads us to speak of the theory of probability and the part it plays (more or less consciously) in physical induction.

Of a future event there can be no certain knowledge; nor are we consigned to absolute ignorance in this regard. Probability, a degree of knowledge or ignorance, is our portion and constitutes the basis and outcome of all research. Now every statement of probability in physical science is based upon an hypothesis, upon the conviction of continuity in the processes of nature. Without this assumption no inference as to the probability of occurrence would be possible. Granting this thesis, we have now to consider the view which maintains that uniformity is not merely an assumption indispensable for scientific constructions, not solely a conviction necessary for practise, but that this concept has also a demonstrable foundation in experience.

The probability of an event is defined as the ratio between the number of favorable cases and the whole number of equally possible cases. It is important to note that in this definition the latter clause, the whole number of equally possible cases, is itself an expression of probability. And, consequently, if any specific probability is to be entirely a matter of experiment, the basis for the statement respecting the equal possibility of the total number of cases must

¹ Poincaré, 'Science and Hypothesis.'

be disclosed. The argument which claims to demonstrate uniformity by means of the calculus of probability may be briefly set forth as follows: Cases of non-uniformity have either never occurred or, admitting their existence, their number has been relatively so small as to be negligible in the argument. That is, the number of cases favorable to uniformity has been practically coextensive with experience. We come now to the second term of the ratio, the number of equally possible cases of uniformity. Whence does experience derive its knowledge of these? The answer to this point forms the crux of the argument. Karl Pearson¹ proceeds upon the basis of Laplace's theory that 'in cases where we are ignorant of the condition of the possible cases, there in the long run all constitutions will be found to be equally probable.' Then, comparing the number of favorable cases with the number of equally possible cases, we obtain that high degree of probability of uniformity which amounts to practical certainty. A little attention to the thesis of Laplace discovers that it simply begs the question which is the subject of proof. By what train of reasoning is the fact established that all constitutions are found to be equally probable in cases where we are ignorant? Is it not obvious that this theory is derived by means of that very calculus of probability, with its implied assumption as to knowledge of the equal possibility of all the cases, which it is pretending to demonstrate? That is, this proof of uniformity is based upon the postulate of some principle controlling occurrence, and hence the argument for its experimental basis falls to the ground. Similarly it will be found that those theories which profess to explain the constitution of an ordered world upon a basis of pure chance always employ tacitly, if not openly, some principle of determination upon which the force of the demonstration depends. Control is a postulate logically necessary to the existence of order, but is never merely a result of physical induction.

Let us now turn to some of the constructions of physical science.

Mechanical theory was wont to describe phenomena in terms of matter and motion. These two ultimate conceptions were specific designations of the permanent and the changing, the two irreducible facts involved in all the complexities of physical science. With the development of physical science, the concept of matter has undergone modifications in order to comply with an increasing accuracy and refinement of description; but throughout the whole variety of postulates we find an adherence to the notion of the permanent. Thus in an early stage of its history matter was defined as an entity qualified by existence in space and time. When a later concep-

¹ 'The Grammar of Science.'

tion replaced these characteristics by the trait of impenetrability, it responded to the same general need, the expression of indestructibility. A subsequent physics, finding this matter too gross for its requirements, proceeded to break it up successively into atoms, prime atoms, ions, etc. Despite the abandonment of spatial and temporal properties, the notion of the unchangeable is retained. The atoms were defined as indecomposable particles whose only motion is that of translation. Strain and rotation, changes in its internal nature, can not be ascribed to them. If the ion supersede the atom as the ultimate element, it is called forth to serve the same function, which is identical in all these conceptions and consists in the expression of the fact of inertia.

In its first significance, motion designated change in matter as extensive. This concept gave way to force, an entity to express the cause of motion, while in the science of to-day force is conceived as a ratio of acceleration, and this means a specific description of variation. Thus these various conceptions of motion are shown to be diverse modes, more or less adequate, of indicating change.

Finally, in the widest generalization of physical science, the principle of the conservation of energy, there are embraced facts both of fixity and of change; and upon ultimate analysis this principle of energy reduces to the assertion that there exists a certain identical element throughout physical processes, a limiting factor in change.

Mach says:¹ "If we estimate every change of physical condition by the *mechanical work* which can be performed upon the *disappearance* of that condition, and call this measure *energy*, then we can measure all physical changes of condition, no matter how different they may be, with the same common measure and say: *The sum total of all energy remains constant.*" We look in vain in the textbooks for a definition of energy. But we learn from such statements as the above that energy is measured by mechanical work. Now mechanical work is equivalent to change in the configuration of things. Energy, then, denotes the fact of change, or, rather, measurable change, such change as can be quantitatively determined. The conservation of energy is an affirmation of a quantitative identity maintained throughout all change. For we learn that energy has various forms, such as heat, light, electricity, magnetism, and that these are convertible; that is, there is a definite relationship existing throughout all variation, a permanent element in the transformation. The great advance which mechanism has made in the explanation of phenomena is largely due to the fact that it is able to express its laws in the form of mathematical equations. Such quan-

¹ 'Popular Scientific Lectures,' translated by T. J. McCormack, 1898, p. 164.

titative determination of change supplies a detailed account of the principle controlling nature.

It is important to observe that the principle of the conservation of energy is not a truth experimentally derived. An inquiry into its origin and the employment of it in investigation discloses (as shown by Mach, Poincaré and others) that it is an assumption logically necessitated in the explanation of physical processes and indispensable for scientific research. Experience verifies its existence, but can not originate the principle. Further, the whole force of this principle in physics necessitates that the principle determining change exists inherently in the process it characterizes. Were the principle regulating change located in a foreign agent, mechanism would be meaningless.

The fundamental dimensions of physical science, mass, length and time, derive their significance from the fact that they tend to supply means of determining the exact conditions governing occurrence, the quantitative limits within which change may take place. These dimensions are independent kinds of measurement, and as such constitute so many different ways of expressing relations between phenomena, of designating specific modes of interdependence. For measurement is the definition of one phenomenon by another,¹ and thus description of things in quantitative terms is rendered possible.

To conclude, then, this investigation of the concept of control as evinced in mechanism: The general assumption of a regulation of occurrence forms the basis of mechanical explanation. The fundamental constructions of physical science characterize the limiting factor of change as a permanent element in variation. As a description of change in measurable terms, mechanism is compelled to assume a quantitative identity maintained throughout alteration. It is required that the determining factor exist inherently in the process it influences.

¹ Mach, *op. cit.*, p. 206, note.

CHAPTER V

CONCLUSIONS AND REMARKS

OUR study of these different instances illustrating the logical necessity of affirming control and the way in which this demand has been satisfied, reveals certain fundamental agreements and dissimilarities among the conceptions. Everywhere (*i. e.*, in the cosmological theories, in the epistemological conceptions, in the principles of biology and mechanism) there is the initial assumption of a world of change, and in all these cases there is the additional affirmation of *definite* movement involving an identical element in variation, a static principle in the dynamic flux, an intelligible feature in sensible existence. It may be said that pragmatism does not assert a permanent factor in the experience process; but since it defines experience as an evolution, each stage the result of a previous condition, one situation or portion of experience a *transformation* of another, we feel justified in saying that the permanent is implied in this description, if not explicitly stated.

The cosmological conception, pragmatic epistemology, the principles of biology and mechanism agree in placing the directive principle wholly within the movement it constitutes a process. That is, the determinate relation between elements is dependent for its nature upon the specific particulars it connects. It is manifested in individuals as a tendency toward results, it is a reference of elements to a dominating whole.

In contrast, according to the epistemological movement terminating with Kant, the regulative principle has its origin in a source distinct from the material which it unifies. It is constituted a subjective activity, reason; while that which it influences is a cosmic reality. The history of thought succeeding this epistemological movement has disclosed the inconsistencies and paradoxes involved in the assumption of a dualism of realities, and thus has evinced the need of a different method of approaching the question.

This leaves us with the moot problem: Is the principle of control a cosmological conception, or is it a function of human experience? Must it be designated a characteristic of a life process, or is it a metaphysical concept to which the psychological is subordinate as a special case?

In the analysis of the conception of pragmatism, it was discovered that knowledge, a controlling function of experience, points to and involves a transcendent control, a determination independent of our

experience of it. Further, it was maintained that knowledge is knowledge by virtue of this property of cognizing a metaphysical control, and exercises its peculiar function in rendering possible an intensification of a cosmical reality. If this position be accepted, psychological control becomes a particular instance of a general cosmical determination.

As an outcome of this discussion of control, it appears that the concept when applied to reality results in two specific modes of describing the nature of things, distinguished by the terms employed. On the one hand, there is the qualitative aspect of nature, incapable of being adequately rendered in physical terms, and whose fundamental nature is described in the category of purpose. I say purpose, for it seems that this term as used by Greek philosophy is best fitted to express the intelligible character of reality designated as a tendency toward results. Again, in mechanical explanation we have things described in their quantitative aspect, or in spatial or physical terms. It is obvious that these two modes of describing one fundamental feature of reality are not mutually exclusive nor contradictory, but coexist. Neither can be reduced to terms of the other; both are diverse but essential modes of denoting the same characteristic expressed in the concept of control.

A word as to some current applications of the category.—The sciences of mechanics, economics and sociology, in investigating the laws of movement respectively describing their distinctive phenomena, include as a fundamental prerequisite the recognition of a set of static principles which present the conditions of equilibrium, or the unchanging. Mechanics has its department of statics, treating of those principles of movement which are the condition of stability. The elaboration of these principles is a necessary antecedent to the formulation of the kinetic laws, since these static principles constitute the controlling elements in the entire field of dynamics. Similarly, economics in its constructions of the laws governing the distribution of wealth in a changing social organization presents as an indispensable preliminary, in its theory of static social economics, the principles which would be operative in an unchanging world. Since existing society always is dynamic, these principles must be abstractions and can have no independent status. Nevertheless the static laws are actually dominant in the variations of wealth occurring in the development of society and constitute the standard to which fluctuations tend to conform. Sociology describes the process of society as a moving equilibrium. The laws which are found to govern social development embrace as a fundamental part social statics, the laws of social coexistence, the conditions which would maintain a social stability.

VITA

The author of this dissertation was born in New York City, in 1874. She was graduated from Normal College, City of New York, in 1893. During the year 1902-1903 she studied at Teachers College, Columbia University, receiving the degree of B.S. in 1903. During the years 1903-1907 she attended courses in philosophy and psychology at Columbia University under Professors Woodbridge, Dewey, Fullerton, Miller, Montague, Sheldon, Tawney and Thorndike; and received the degree of A.M. in 1904.

